

ABSTRACT OF THE DISCLOSURE

An apparatus comprises a check bit encoder circuit and a check/correct circuit.
The apparatus operates on encoded data blocks, wherein each encoded data block
5 includes a data block, a first plurality of check bits, and a second plurality of check bits.
The encoded data block is logically arranged as an array of R rows and N columns, and
each of the N columns comprises data bits from a respective one of the plurality of
components. The first check bits form a first column of the array, and each of the first
check bits covers a row of the array. The second check bits form a second column of the
10 array and are defined to cover bits in the array according to a plurality of check vectors.
Each check vector corresponds to a different bit in the array and is an element of a Galois
Field ($GF(2^R)$). The check vectors are derived from a plurality of unique elements of
 $GF(2^R)$, each of which corresponds to a different column of the array. The check vector
in row X of the column is the product, in $GF(2^R)$, of the unique element for that column
15 and α^X , wherein alpha is a primitive element of $GF(2^R)$.